

TO: Andrew Christensen, Chair, Space Science Advisory Committee

FROM: Jonathan I. Lunine, Chair, Solar System Exploration Subcommittee

SUBJECT: Solar System Exploration Subcommittee Meeting

The Solar System Exploration Subcommittee (SSES) of the Space Science Advisory Committee (SScAC) met on March 6 and 7, 2003 in Tucson AZ. The purpose of this memorandum is to summarize the findings of that meeting and ask SScAC to consider them and transmit its recommendations to Colleen Hartman, Director of the Solar System Exploration Division and Orlando Figueroa, Director of the Mars Exploration Program.

Solar System Exploration Program

1. Project Prometheus/Jovian Icy Moons Orbiter

The committee heard presentations on this exciting new initiative from A. Newhouse (technical) and C. Hartman (programmatic and science). Prometheus, which involves developing nuclear reactors for use in power generation in space, carries with it the potential for a revolution in planetary exploration, in making available power at a level 100-1000 times larger than previously and electric propulsion independent of heliocentric distance. Prometheus will create a paradigm shift in the way deep space missions could be done, and in the way scientific investigations are done. The high power levels afford the potential of moving from dominantly passive sensing to high-powered active sensing and to novel sample acquisition and in-situ analytical capabilities.

SSES believes that formation of a Science Definition Team (SDT) for JIMO and a Science Concepts Definition Team (SCDT) for the program overall is a very positive step forward, and we applaud these steps by HQ. The high power instrument NRA planned for this spring and an LPI (June 12-14) workshop on instrument and mission concepts are important in two respects. First, they represent opportunities for early community input into the Prometheus development and to enable the community to understand the capabilities and new challenges of Prometheus. Second, they are a key initial step toward implementing a new generation of instruments that will function in and take full advantage of this technology. To keep these new developments grounded to real scientific needs, it would be beneficial to recycle and reissue the Outer Solar System Workshop report, in which a number of mission concepts potentially enabled by Project Prometheus technology are described.

SSES points out that radioisotope power sources will always be needed for certain classes of missions, both before and during the Prometheus era. Hence, there is a strong imperative for NASA/DOE to proceed forward with the multiple mission radioisotope power system development in parallel with Project Prometheus. Finally, the excellent overview presentations prompted SSES to request more detailed presentations on schedule, technology and instrument gates, and on JIMO capabilities etc. These will be provided at our summer meeting.

2. Discovery

SSES was briefed on the possible cancellation of the Deep Impact Discovery mission associated with mounting cost problems. Were the cancellation to happen it would be a regrettable loss of science, but SSES recognizes the need for programmatic discipline to retain the viability of the Discovery Program.

SSES intends, in its future meetings, to look at the evolution of the Discovery Program to understand the new pressures and opportunities in mission development as the program has matured over time. The hiring of additional people in the Discovery program is essential to the viable management of the program and SSES lauds NASA in its successful efforts in this area. SSES recommends that a formalized approach to “lessons learned” be developed to enable new PI’s to learn from the experiences of the old. Whether this be done by HQ, the community or both together, it is essential to develop and retain the small missions equivalent of a *Vade Mecum*¹ to enable the lessons learned to be diffused and understood through the community and hence to improve the Discovery Program.

3. New Frontiers

C. Hartman’s briefing on the status of the Solar System Exploration Program included a status report on the inauguration of the medium-class New Frontiers line. SSES applauds the imminent release of the New Frontiers AO, which is key to implementing the medium-class mission recommendations of the NRC’s decadal survey in solar system exploration. New Horizons has been designated as the first New Frontiers mission. The SSES finds this to be appropriate both programmatically and scientifically, and endorses an AO approach that solicits for all four remaining medium-class missions addressing high-priority goals of the recently completed decadal survey.

There will be novel management and programmatic challenges in the New Frontiers program because of the mission size and NASA must be prepared to deal with these. Lessons learned from Discovery need to be transmitted and adapted to the challenges associated with the New Frontiers program, but these lessons must be applied within the context of the larger mission scale.

¹ The SEA-MAN's *Vade Mecum*: Containing the most Necessary Things for qualifying Seamen of all Ranks, viz.
 I. *Vulgar* and *Decimal Arithmetick*, familiarly demonstrated and fitted to the Meanest Capacity.
 II. An exact *Sea Dictionary*.
 III. What Winds will carry a Ship from one Port to another, and the *Distance* and *Bearings* of those Ports.
 IV. The Theory and Practice of *Gunnery*, fully discuss'd in all its Parts; Together with the Duty of all the *Officers* belonging to a Ship.
 V. His Royal Highness Prince *George's* Regulations of *Officers*.
 VI. A compleat List of the *Royal Navy*.
 VII. Trigonometry, apply'd to Plain, Oblique and Mercator Sailing.
 VIII. An Abstract of all the Acts of Parliament relating to *Seamen*; together with a Table of *Seamens* Wages.

LONDON:

Printed and Sold by James Woodward
 behind the *Royal-Exchange*, 1707.

4. Astrobiology roadmap

D. Desmarais (NASA Ames) presented by videocon a summary of the new Astrobiology Program roadmap. The statement of operating principles and the seven areas of focus (goals) provide a framework that can and should encompass all key areas of astrobiology, even those not explicitly mentioned in the short descriptors of the focus areas. Given the importance of astrobiology to NASA and its cross-cutting nature, the SSES intends to follow the implementation of the roadmap in the various areas of scientific research addressed by the Astrobiology Program.

Carl Woese' recent capture of the Crawford Prize illustrates that NASA funding (in this case exobiology), over long time periods, of leading scientists via R&A programs leads to fundamental contributions to science.

Mars Program

5. SSES was briefed by O. Figueroa on the status of the Mars Program, and commends him along with J. Garvin for their stewardship of this complex and high priority program. SSES notes and congratulates the program on achieving the number one ranking by the Office of Management and Budget for planning, management, and results among all federal programs evaluated in 2002. Significant challenges and opportunities remain, of course, and the SSES identified several areas for comment and future action. SSES identified several areas of concern where it levies suggestions and requests for additional information.

6. Mars Science Laboratory

SSES is pleased to see that progress is being made here, although significant problems remain in the development of this program so key to Mars Exploration. New requirements are being levied, and with the resignation of the Project Scientist, there is the potential for a disconnect between ongoing development and the science community. SSES will take a much deeper look at this project following the MSL Concept Workshop to be held in April.

7. International cooperation lessons learned

SSES regrets the problems associated with the international partnerships in the Mars exploration program. SSES would like to hear a briefing on the factors associated with international collaboration, e.g. ESA-based versus individual-nation-based collaborations, and other issues, to obtain a broader perspective on the difficult but important challenge of international cooperation.

8. Recovering the science of the unconfirmed Netlander

SSES understands that with the loss of the international partnership the Netlander plans as drawn are not implementable and NASA will not confirm this Discovery mission of opportunity. But the science covered under the mission is important and the Netlander team should be encouraged to explore other venues under which it could be implemented, e.g., Scout.

9. The SSES congratulates the Mars Exploration Program in bringing MER to the ATLO phase for two rovers, and looks forward eagerly to the launch and results of this mission. SSES will continue to follow the progress of this mission closely.

Other issues

10. Participating scientists in future missions

SSES recognizes that missions of long duration benefit from the addition of scientists who did not have the opportunity to be a part of the original selection, or for which the science has changed in such a way that broadening of the science base is desirable. For this reason, adequate planning for participating scientist programs in future missions is encouraged.

11. Data rights policies in future missions

SSES lauds NASA for its efforts to define a specific data rights policy for future missions and encourages the kind of explicit policy that is present in Mars Exploration.

12. Solar System studies with the James Webb (Next Generation) Space Telescope

C. Beichman (JPL) briefed SSES on the potential solar system science that could be done with the JWST telescope and its uniquely sensitive infrared capabilities. The SSES points out in particular that cold, large-aperture telescopes can significantly expand the range of detection for, and the study of, small bodies in the Solar System, notably the trans-Neptunian objects.

Permit me to close this first letter of my chairmanship by expressing enthusiastic anticipation for the job ahead in these challenging yet promising times for the nation's space science program.

With best regards,



- c. Dr. Colleen Hartman, Director, Solar System Exploration Division
Dr. Orlando Figueroa, Director, Mars Exploration Program
Dr. Jay Bergstralh, Associate Director, Solar System Exploration Division
Dr. Jim Garvin, Lead Scientist for Mars, Office of Space Science
Solar System Exploration Subcommittee